

**CLAIMS**

1. A method of analysing a signal obtained by applying excitation to a sample and detecting a resonance response, the method comprising:  
5 producing a model of the signal; and  
comparing the model to a predetermined model of a signal due to a phenomenon, thereby to determine whether the model represents a signal due to that phenomenon.

10 2. A method according to claim 1 wherein the predetermined model is a predetermined model of a response from a particular sample and the comparing step is to determine whether the model represents a response from the particular sample.

15 3. A method according to claim 1 wherein the signal comprises a response from a sample and an undesired signal and the comparing step is to distinguish the response from the undesired signal.

4. A method according to claim 3 wherein in the producing step the  
20 model models the response and the undesired signal.

5. A method according to claim 1 comprising the steps of comparing the model to a predetermined model of a response from a sample, and comparing the model to a predetermined model of an undesired signal.

25 6. A method according to claim 1 wherein the producing step and the comparing step are carried out with models having increasing numbers of components.

30 7. A method according to claim 1 wherein the producing step is carried out using a statistical time domain technique.

8. A method according to claim 1 being a method of testing a sample, further comprising applying excitation to the sample and detecting the response to yield the signal.

5 9. A method of analysing a signal to test a sample, the method comprising:

detecting a signal comprising a resonance response from the sample;  
producing a model of the signal; and

10 comparing the model to a predetermined model of a signal due to a phenomenon, thereby to determine whether the model represents a signal due to that phenomenon.

10. A method according to claim 8 wherein the model is compared to a predetermined model of an undesired signal, the method further comprising applying 15 further excitation in dependence on the result of the comparison.

11. A method according to claim 8 wherein the excitation is arranged to excite quadrupole resonance.

20 12. A method of detecting the presence of a sample in a larger sample which is not known to contain the sample, comprising:

detecting a signal comprising a response from the sample;  
producing a model of the signal; and

25 comparing the model to a predetermined model of a response from the sample, thereby to determine whether the sample is present.

13. A method according to claim 12 further comprising providing an alarm signal if the sample is determined to be present.

30 14. A method according to claim 1 wherein the method is a method of nuclear quadrupole resonance testing a sample containing quadrupolar nuclei, which

sample may give rise to spurious signals which interfere with response signals from the quadrupolar nuclei, the method further comprising:

applying a pulse sequence to the sample to excite nuclear quadrupole resonance, the pulse sequence comprising at least one pair of pulses;

5 detecting response signals; and  
comparing, for the or each such pair, respective response signals following the  
two member pulses of the pair;  
the pulse sequence being such that respective spurious signals following the  
two member pulses can be at least partially cancelled by the comparison without  
10 corresponding true quadrupole resonance signals being completely cancelled.

15. Apparatus for analysing a signal obtained by applying excitation to a sample and detecting a resonance response, comprising:

producing means for producing a model of the signal;

15 storing means for storing a predetermined model of a signal due to a phenomenon; and

comparing means for comparing the model to the predetermined model to determine whether the model represents a signal due to that phenomenon.

20        16. Apparatus according to claim 15 wherein the apparatus is adapted to produce models of the signal, and to compare the models to a predetermined model, until the model is determined to represent a signal due to the phenomenon or until a given number of repetitions have been completed.

25        17. Apparatus according to claim 15 wherein the apparatus is adapted to produce models of the signal, and to compare the models to a predetermined model, with models having increasing numbers of components.

18. Apparatus according to claim 15 being apparatus for testing a sample,  
30 further comprising means for applying excitation to the sample and means for  
detecting the response to yield the signal.

19. An apparatus for analysing a signal, to test a sample, the apparatus comprising:

detecting means for detecting a signal comprising a resonance response from the sample;

5 producing means for producing a model of the signal; and

comparing means for comparing the model to a predetermined model of a signal due to a phenomenon to determine whether the model represents a signal due to that phenomenon.

10 20. An apparatus according to claim 19, further comprising applying means for applying excitation to the sample to excite the resonance response.

15 21. Apparatus according to claim 19 wherein the apparatus is adapted to compare the model to a predetermined model of an undesired signal and to apply further excitation in dependence on the result of the comparison.

22. Apparatus according to claim 18 being a quadrupole resonance apparatus.

20 23. Apparatus for detecting the presence of a sample in a larger sample which is not known to contain the sample, comprising:

detecting means for detecting a signal comprising a response from the sample; producing means for producing a model of the signal;

25 storing means for storing a predetermined model of a response from the sample; and

comparing means for comparing the model to the predetermined model to determine whether the sample is present.

24. Apparatus according to claim 23 further comprising means for 30 providing an alarm signal if the sample is determined to be present.

25. Apparatus according to claim 15 being apparatus for nuclear quadrupole resonance testing a sample containing quadrupolar nuclei, which sample may give rise to spurious signals which interfere with response signals from the quadrupolar nuclei, comprising:

- 5        means for applying a pulse sequence to the sample to excite nuclear quadrupole resonance, the pulse sequence comprising at least one pair of pulses;
- means for detecting response signals; and
- means for comparing, for the or each such pair, the respective response signals following the two member pulses of the pair;
- 10      the pulse sequence being such that the respective spurious signals following the two member pulses can be at least partially cancelled by the comparing means without the corresponding true quadrupole resonance signals being completely cancelled.

15      26. A computer readable medium having stored thereon a program for carrying out the method of claim 1.